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Pricing the World's Copper Output

THE announcement by R.S.T. that it has abandoned its policy of fixing a price for its copper and is reverting to the previous practice of pricing according to the London Metal Exchange marks the end of an epoch. It was an experiment that *The Mining Journal* has looked upon with interest and, indeed, sympathy, although we have never disguised our feeling that, whatever may seem appropriate at any particular time, the selling of copper requires in the long run a professional market in the interests of both producers and consumers. In fact, the policy has not worked out in the way in which R.S.T. had hoped.

It was certainly least unsuccessful when the market was rising. Even so, it gave fabricators and others complicated problems in pricing their products, especially if they were taking in metal from two sources at two prices. Its gravest defect in these circumstances was that it did nothing to choke off the marginal consumers at a time when demand was outstripping supply and, indeed, in this respect, it must have helped to force up the L.M.E. price. When the market was in decline the defects of the policy were even more obviously apparent. Whenever the L.M.E. quotation fell to anything more than £10 below the R.S.T. price speculation immediately began as to the time of the next R.S.T. cut; when the cut came it was taken as evidence of fresh weakness and the market slumped still further.

Now that the policy has ended it remains to consider what will be the future. What is most obvious is that there is no simple reversion to the *status quo ante*. Circumstances have changed in four important particulars.

First, the fixed price policy coincided with growing independence on the part of the American custom smelters. These smelters are selling quite independently of the big producers; and, so long as they can maintain their high proportion of scrap consumption, they can remain largely independent of the big producers for their supplies. The importance of the custom smelters is that they introduce the element of freedom in the United States which the L.M.E. provides in Britain.

Secondly, the L.M.E. has proved it is a sound organism in the most difficult circumstances. In the space of eighteen months it has seen copper up to well over £400 a ton and down again to well below £200. And it has seen this wild swing through without embarrassment. Its prestige is certainly higher.

Thirdly, the Exchange now has, what it previously lacked, enough chips to conduct itself as an effective market. There is also a contango which appears to be firmly established and likely to continue for as far ahead as can be foreseen. The circumstances are, in fact, right for hedging as they have never been since the war.

Fourthly, throughout the period of the experiment and, indeed, for much further back, the Exchange has been in difficulties over the terms of its contract. The problem is simply stated; on the one hand to narrow the definition so that both buyers and sellers are dealing in a common commodity, and on the other hand to widen the definition so as to permit the buying of copper in the many shapes and forms which modern industry demands. However,

technical changes in Britain and the development of adequate smelting facilities in Northern Rhodesia will, it may be expected, lift both cathode and blister copper from the market in about a couple of years. This will then leave the market dealing almost exclusively in wirebars.

Although the position of the London Metal Exchange is now considerably improved, the future is by no means clear. Those who are convinced copper must be sold on fixed price contracts are both numerous and powerful. The big American producers are plainly wedded to the idea; the Chilean producers are not at all unwilling to adhere to fixed prices if they can be used to rig the market; at least one Rhodesian producer has shown himself willing to experiment with fixed prices.

Nor on the other hand should one exaggerate the strength of the forces making for a free market. It is true that the American custom smelters bring great flexibility on the other side of the Atlantic. Yet the enormous cost of building a smelter puts it beyond the financial resources of any but governments (as in Yugoslavia) or the big metal producers (as in America). This is not to say that custom smelting is uneconomic. But it is perhaps unlikely that the number of custom smelters will grow in the future.

What one can say of the immediate future is that the London Metal Exchange now has an immense opportunity to show that it can price the world's output in a satisfactory manner and that it renders a real service to both producers and consumers. How long this opportunity will last is difficult to say. But it is not difficult to imagine circumstances in which the demand for another attempt to fix copper prices may be irresistible. The argument would then be that the experiment of the last two years failed not because of any inherent weakness but because it was tried out over too narrow a sector of the copper mining industry. If another attempt at fixing prices is made it will surely embrace a much wider area of world copper production.

The London Metal Exchange is, for the moment, in a potentially strong position, but this has still to be consolidated. Dealings on the Exchange are nowadays running at about 15 per cent of the tonnage of U.K. copper consumption. There seems to be fairly widespread agreement that dealings should be at about twice this level for the market to operate comfortably and for the L.M.E. quotations to be regarded as an accurate and not too mercurial yardstick of world market trends. This increase may, of course, come about partly by increased hedging operations now that the contango is established, but, in the main, it must come through the producers agreeing to put just that much more of their production through the market. It is difficult to imagine that the consumers would raise any objection to the consequent slight readjustment to their buying habits.

DIFFICULTIES OF AUSTRALIAN COPPER MINES

The fall in prices for lead and zinc, and particularly in the market for rutile, has had a depressing effect upon Australian mining, accentuated by the persistent reduction in the price for copper. This is particularly serious as the four large producers, Mount Isa Mines, Mount Morgan, Mount Lyell Mining and Railway Co. and Peko Mines, have put substantial capital into forward plans for increased output.

Recent balance sheets have shown the unfortunate effects of the market recession. At a London price of £191 per ton, the equivalent Australian price for metal is £240, but the Australian price fixed by the local producing companies is being held at £330 per ton. In the last financial year's operations, the Mount Lyell Co. lost £60,000 on mining operations, despite improved mining facilities and increased treatment capacity, the company's dividend position being carried by investments. The profit from actual mining by Mount Morgan Ltd. was £A23,000, the balance of the year's profit of £A395,000 being earned from the treatment of old, accumulated concentrates. It is stated that a metal price of £336 per ton is necessary to cover Mount Morgan's operating costs.

Mount Isa Mines is having difficulty in maintaining profits from copper, and is well embarked on a large expansion policy, including a £A3,000,000 copper refinery at Townsville, capable of dealing with blister copper production expanded to 60,000 tons per year. No comment has been made as to the immediate future, but it is thought that the programme planned will be continued; some financial arrangements, other than those intended, may be necessary.

The youngest and smallest copper producer, Peko Mines, in the Northern Territory, is also facing difficulty, its financial position being affected by expenditure on extensions to plant to bring output into line with the improved ore position. This mine has to face the adverse factors of remoteness, and corresponding high costs, together with transport charges on concentrate for 2,500 miles or so to smelters on the Australian coast; the problem of economic smelting at the mine does not seem to have been solved as yet.

The outlook for Australian copper mining is gloomy; two mines only, Mount Morgan and Peko, are assisted by any appreciable enrichment from gold.

THE COST OF UNDERGROUND GAS

There are hundreds of millions of tons of coal in Britain which are unmineable by ordinary means, but which might be exploited by the underground gasification process. Trials in underground gasification have therefore been in progress for several years, and last year the hope was expressed that the cost of using such fuel in power stations would be less than that of oil fuel or nuclear energy.

A few months ago it was announced that work on underground gasification was to be considerably stepped up and that the London firm of Humphreys and Glasgow had been appointed as contractors to the National Coal Board to develop a scheme at Newman Spinney, near Chesterfield. This project involves the construction of a pilot plant, scheduled to be in operation by the end of next year, which will serve a 3,750 kW. generator to be built by the Central Electricity Authority. Designs are also being prepared for the first full-scale commercial plant, which will be built if results of the pilot scheme are sufficiently encouraging.

In a paper presented recently to the North of England Institution of Mining and Mechanical Engineers, the view was expressed that the cost of making gas from coal underground was likely to be even less than forecast last year. The author of the paper, Mr. C. A. Masterman, has been actively engaged for some eight years with underground gasification, first with the Ministry of Fuel and Power and the National Coal Board and subsequently as a full-time member of the team brought together by the contractors.

Mr. Masterman said that underground gas used to generate electricity might cost about 4d. per therm in an installation constructed on the basis of present-day experimental technique. This compares with 4d. per therm, the average cost of coal to power stations, and a cost of 6d. per therm for imported coal. By 1964, improvements in technique and streamlining of engineering work might bring the cost of gas made underground to 1.8d. per therm. In the long run a cost of lower than 1.7d. per therm might well be attainable.

Much of the utlimate cost of the gas will depend on the cost of sinking the shafts, driving the galleries and drilling the boreholes. The estimates given in the paper are based on a comparatively thin and shallow seam—3 ft. thick, 400 ft. deep. Even if the depth were increased to 1,000 ft., however, the cost of gas would be increased by only some 15 per cent. On full commercial scale for a single station some 10 miles of boreholes with associated galleries and shafts would be required each year. This would be largely repetition work, however, and considerable streamlining should be possible to reduce costs.

The National Coal Board is carrying out a survey for sites suitable for a commercial installation.

The paper pointed out that, with the development of nuclear power to meet Britain's electricity base load, meeting the peak demand by other means might become an increasing anxiety because of the high capital cost and low "fuel" cost of nuclear power. A flexible low cost output from underground gasification might then be a specially useful complementary source of supply. Convincing evidence to justify the planning and preparation of the first commercial system should not be long delayed, suggested Mr. Masterman, adding that there seemed good prospects of reaching this stage by 1959.

MINERALS IN THE FRANC ZONE

Lead ore production in the franc zone during 1956 amounted to 192,193 tons including 120,047 tons from Morocco and 38,787 from Tunisia.

Average content was 68 per cent with a processing loss of about 5 per cent. Some 165,000 tons of ore were processed in France, Tunisia and Morocco to produce 115,600 tons of metal of which 63,300 tons were treated in France itself, 24,000 tons in Tunisia and 28,100 tons in Morocco.

Franc zone production of zinc ore in 1945 was 157,000 tons of 55 per cent mineral of which 70,921 tons were from Morocco, 54,234 tons from Algeria and 23,135 tons from Metropolitan France. Imports of foreign ore amounted to 138,700 tons, mainly from Spain, Peru, Italy and Australia. French industry thus disposed of a total of 295,000 tons of ore of which 282,000 tons were used for the production of metal.

Output of cadmium declined sharply by about 40 per cent to 109 tons plus 90 tons produced during zinc operations on French account. Imports rose to 361 tons against 301 tons in the previous year.

Morocco was the sole supplier of cobalt ore with an output in 1956 of 6,400 tons against 7,500 tons in the preceding year. Some 5,100 tons of ore were processed in France and 700 in Belgium with a total-metal output of 374 tons. Domestic needs were covered and imports and exports were negligible.

New Caledonian output of nickel ore increased by 25 per cent in 1956 to reach the record level of 1,240,000 tons. Exports to Japan rose during that period from 336,000 to 701,000 tons. Moreover, West Germany and Australia took 45,000 tons each and France 24,000 tons.

Output of metallic nickel in New Caledonia in the form of matte and of ferro-nickel was slightly smaller at 9,650 tons. The matte reprocessed at Le Havre yielded 5,150 tons of metal against 5,500 tons in the previous year. Some 1,300 tons were exported and it was necessary to import 1,675 tons—mainly from the U.K.—of nickel for special purposes. This last figure is very close to that for 1955. Thus, French nickel requirements were almost completely covered and the French market for this metal was distinct from the world market.

Output of copper concentrates in the franc zone was insignificant at 3,800 tons compared with domestic requirements which in 1956 amounted to 187,800 tons of metal. The output figure included 2,863 tons from Morocco, 545 tons contained in mattes from a domestic gold/silver/copper mine and a few hundred tons from a pilot plant operating on mineral that has been supplied from Mauritanian mines.

French Africa supplied 20,000 tons of ilmenite and 750 tons of rutile during 1956 and imports were limited to a total of 6,400 tons of foreign mineral.

Moroccan output of manganese ore increased by 10,000 tons to a total of 421,000 tons in 1956. The U.S. took 121,000 tons of the output, while 266,000 tons went to France.

New Caledonian chrome output rose slightly to 49,000 tons of which 34,000 tons were exported to the U.S., while 15,000 tons were sent to France.

Antimony ore output advanced to 6,500 tons, most of which was treated in French plants. Some 1,584 tons of metal were produced, a decline of 15 per cent from the previous year.

DE-MINERALIZATION OF MINE WATER

Further information has been released regarding the world's first large-scale desalting plant, capable of producing 2,500,000 gals. of fresh water daily, now being constructed at the Free State Geduld Mine in the Orange Free State. The plant will treat the brackish water pumped from the mine and is expected to be in full operation in 1958. If, as is expected, it proves successful, further plants may be constructed in the goldfield. The plant employs the electrodialysis process and should provide unique opportunities for investigating its possible application not only to mining but also to other industries and agriculture.

The cost of treatment in the new plant, including redemption of capital and interest, will be 2s. 6d. per 1,000 gals., although it is hoped that this may be subsequently reduced. Purified water will be sold to certain of the Orange Free State mines at 2s. per 1,000 gals., which is what they pay at present for water from the Vaal River. In addition, these consumers pay a further 3d. per 1,000 gals. which is the normal cost of evaporating underground water in dams. Thus the plant should be able to produce demineralized water at about the same cost as the mines pay for fresh water and for disposal of brackish water.

At present 18,000,000 gals. of water per day from the Orange Free State mines need to be evaporated over vast areas of land. The new process should save this land for productive agriculture and also reduce the demand on fresh water supplies from the Vaal River.

The development of the electrodialysis process was undertaken in 1953 by the National Chemical Research Laboratory of the Council for Scientific and Industrial Research with the financial and technical aid of the Anglo American Corporation of South Africa, Limited. In 1954 a development agreement was made which was extended to include other gold-mining groups. A pilot plant was established on Western Holdings mine in 1955 and provided the necessary data for the construction of the new plant at the Free State Geduld mine.

A British firm, the Permutit Company Limited is supplying materials for the de-mineralization process and is sponsoring further research.

Theory and Practice of Flotation

In this article Our Own Correspondent concludes his review of the International Mineral Dressing Congress held at Stockholm from September 18 - 21, 1957. The next meeting is to be held in Great Britain, the Institution of Mining and Metallurgy having accepted the invitation to arrange a meeting early in 1960.

FOUR papers were presented in the fourth section, dedicated to Flotation Theory, of the International Mineral Dressing Congress in Stockholm. "Fatty acids in flotation" (IV : 1), by C. du Rietz, described investigations dealing primarily with the formation of chemical compounds between the metal ions from various minerals and fatty acids as well as other ions in the pulp. This problem was studied by determining solubilities and the precipitation constant, since the precipitation of metal salts of the collector reagents is a measure of the reaction at the surface and, assuming the more specific effects are due to purely chemical forces, the results should be a clue to the selection of the best flotation reagent. The author shows that there is a close connection between the solubilities and flotation conditions.

In "Solution of some problems concerning the theory and practice of selective flotation in the U.S.S.R." (IV : 2), by S. I. Mitrofanov, the action of depressors and activators was discussed ; in particular, the collector desorption effect of sodium sulphide. The author pointed out that, whilst sodium sulphide is commonly used as a sulphidiser, its use in selective flotation is limited other than in the U.S.S.R.

Several examples were given, such as the production of a clean molybdenite concentrate and other selective flotations. In separating such a bulk concentrate, it is necessary to keep a concentration in the cell since the presence of any collector would immediately promote flotation. On the other hand, if the described collector, as well as excess sodium sulphide, is removed by washing and separation of the liquid phase, selective flotation can be carried out. It is suggested that the technique can be used for lead-zinc ore carrying pyrite or some of the copper minerals when the lead can be first floated in the presence of cyanide, and the chalcopyrite next removed by lowering the *p*H. Finally, the sphalerite is recovered in the conventional manner.

Desorption with sodium sulphide has also been used to clean a zinc concentrate contaminated with copper, lead and iron sulphides.

The use of cyanide was also discussed, as well as complexes with base-metals such as the zinc sulphate-cyanide mixture. Interesting points brought out were that activated charcoal has been used to remove excess organic compounds ; a process for production of saleable scheelite by means of long conditioning with sodium silicate at 70° to 80°C. before cleaning ; and the use of pyrolusite as an oxidiser, the last-mentioned being used to separate arsenopyrite and pyrite.

The "Adsorption of diethyldithiophosphate and butyl xanthate by sulphides" (IV : 3), by S. I. Mitrofanov and V. G. Kusnikoya, discussed investigations into the quantity of collector adsorbed by chalcopyrite, pyrite and sphalerite at various *p*H values and in the presence of various electrolytes.

This paper was particularly interesting since the investigation has been extended to much lower *p*H values than had been previously examined and the authors have shown that the adsorption of diethyldithiophosphate is highly selective. The effect of *p*H alone seems roughly to increase adsorption markedly in the lower range.

In the case of butyl xanthate, the adsorption curves have maxima at a *p*H around 4.5 to 5, probably due to the instability of xanthates in an acid solution, and the authors have shown that the effects of certain electrolytes are very different from those with diethyldithiophosphate.

The study of these results should be of some considerable interest to those interested in selective flotation and of flotation at low *p*H values.

In "Investigations of the action of modifying agents in flotation" (IV : 4), by Bogdanov, Hainman, Podnek and Janis, the authors report on their study of the action of many common anionic collectors and modifying agents, but this paper was not presented to the Congress by the authors and was not discussed.

Flotation of Sulphide Ores

This section comprised three papers. "Flotation of complex copper-lead-zinc ores" (V : 1), by F. W. McQuiston, presented a general survey of practice employed at plants in Canada, Colorado, Mexico, Peru and South-West Africa for the flotation of complex ore, methods being discussed having regard to the complexity of the ore and the flotation characteristics of component minerals. The value of this paper lies in the fact that a certain pattern can be traced in the practices.

Cyanide has no effect on galena, little on chalcocite and on covellite, but cyanide or zinc-cyanide complexes are excellent depressors for chalcopyrite, bornite, tennantite and usually for tetrahedrite and enargite. When the lead to copper mineral ratio is about equal, cyanide is the most effective reagent, a high lead/copper ratio causes losses of copper in the lead and may require special treatment, a bulk concentrate carrying appreciably more copper than lead, can probably be separated by depression of lead rather than of copper, whilst cyanide and zinc cyanide complexes are not suitable for ore containing substantial amounts of chalcocite or covellite, high ratios of copper to lead, or appreciable amounts of tarnished or oxidised galina.

Prof. Rey contributed to the discussion dealing with sphalerite activation and the effect of starch, and other contributors asked a number of questions. Mr. Noakes gave some information on copper-cobalt separation.

In "Differential flotation of lead-zinc ores" (V : 2), by M. Rey, the author reviews the principal factors influencing the operation and attempts a classification of ores based on the abundance and nature of the iron sulphides, the degree of oxidation, the basic or acidic nature of the gangue and the presence or absence of copper minerals.

Professor Rey classifies the ores into four groups, namely unoxidized, oxidized-acidic gangue, oxidized-basic gangue and ores containing copper minerals of secondary origin.

He then further divides these groups into types depending on the presence of iron minerals and the presence of copper minerals. The result is a very detailed study of the flotation properties of a variety of lead-zinc ores in which the author discusses the selection of collector and depressors and the order in which the separation of the component minerals can be made.

Some comments were made by Mr. Gregerac and Mr. E. J. Pryor, who said that he thought that whilst hydroxyl ions had a depressing effect, bicarbonate ions might have some promoting effect. M. Rey agreed, although he thought the ratio of these ions might be difficult to control.

" Separation of Bulk Sulphide concentrates by flotation " (V : 3), by A. Konev and L. Debrivnaja, described how the authors investigated the desorption of the collector from the mineral surface by means of sodium sulphide, employing a captive bubble technique, and established that such desorption of collectors takes place with sulphide minerals.

Investigations have shown that the process of desorption at a mineral-air bubble interface differs from that at a mineral-liquid interface and mineral surfaces covered with air bubbles are not so readily affected by the sodium sulphide as access to the ions is more difficult. It has been shown that desorption proceeds mainly along the contact contour, spreading very slowly from the periphery of the covered area to its centre. As a result, it was concluded that in any commercial application it would be extremely important to work out the conditions favouring rupture of the mineral-air bubble contact.

Experiments have also shown that sodium sulphide is effective with xanthates, dithiophosphates and oleic acid.

The technique and equipment used in the application of the desorption process on a bulk lead-copper, zinc, pyrite concentrate at the Leninogorsk concentrator is described and advantages of the method discussed.

M. Rey inquired whether it was possible to work with oxidized ores and M. Konev said, in reply, that one plant did indeed separate in presence of oxidized minerals.

Flotation of Non-Sulphide Ores

" Flotation of hematite ores with tall oil emulsions " was discussed by P. G. Kihlstedt, whose paper described investigations carried out with emulsions of tall oil and fuel oil in water, with particular reference to the separation of hematite and apatite. In this work, two avenues were followed — the study of fundamental factors and the empirical investigation of collector reagents.

From the fundamental studies, it has been possible to work out conditions for selective flotation and it has been shown that at a *p*H of 8.5 calcium floats preferentially, but at a *p*H <5.5, the iron minerals float whilst calcium phosphate does not, provided the *p*H is not lowered to about 3 when flotation ceases. Fluoride ions and sodium silicate have also been shown to assist depression. Good flotation has been found possible when emulsions are used without desliming — an important factor in this work. The writer suggested four alternative ways to achieve selective flotation, but favoured apatite flotation, followed by hematite recovery.

Dr. Erberich said that he thought oil soluble emulsifiers were better than water soluble types. F. B. Michell compared the action with flotation of micaceous where fuel oil ratio was very much higher and queried the possibility of table flotation if a very coarse concentrate was desired.

In " An investigation into the collecting properties of some of the compounds of tall oil " (VI : 2), by P. Kivalo and E. Lehmurvaara, the results of flotation of magnetite with the various fractions present, (and results of contact angle measurement), was discussed. Collecting power appears to increase as the unsaturation increases.

In " Selective flotation of non-sulphide minerals " (VI : 3), by M. A. Ejgeles, the author discussed the effect of depressants, and described investigations with a contact device which is a modification of the apparatus suggested by Nilsson. In this work it has been shown that the forces of adhesion and the time of adhesion on an extensive surface are many times greater than those required for particles to become fixed to a bubble. It has also been possible to establish the effect of depressor on minerals in the absence of collectors.

From these investigations, it is concluded that an important function of depressors, apart from reducing the amount of collector adsorbed, is the direct effect on the natural wetability of the mineral surface, since a number of minerals tested were shown to adhere to air bubbles after long contact periods. Based on these studies, the author has given examples of selective flotation in which the separation of minerals with similar properties has been possible, such as fluorite-calcite, fluorite-barite, calcite-apatite and diasporepyophyllite.

In the last paper of this section, " Flotation of uranium from the gold-uranium ores of the Witzwatersrand and the Orange Free State " (VI : 4), by J. Levin, the problem is discussed, and it is pointed out that usually the process has not been adopted, since of the 28 mines now producing uranium, only three employ flotation before acid leaching because the values are too low for direct leaching.

In general, 20 to 30 per cent of the uranium can be recovered in the co-called "carbon" concentrate (containing thucholite, a hydrocarbon carrying inclusions of uraninite) by using a frother only, although a little hydrocarbon oil is often helpful. When xanthate is added, further recovery is made and still more can be achieved by using oelic acid to recover uraninite, but the last-mentioned reagent poses some problems, especially after cyanidation, due to the presence of lime—acid washes and filtration prior to flotation are effective, however.

Test work in Canada, using a special reagent combination, was encouraging, but high reagent cost and disappointing results in run of mine ore caused it to be dropped. In the three instances where flotation is used, the grade is too low to permit direct leaching and the pyrite is recovered from the residues after the concentrate has been leached for uranium.

This paper was not presented for discussion.

Processing by Chemical Means

Five papers comprise the relative section and cover processing by chemical means. In " Some aspects of the uranium milling industry " (VII : 1), by Erik Swenke, the present techniques of both acid and alkaline treatment are summarized, technical developments such as resin in pulp and solvent extraction discussed, as well as the application of conventional ore-dressing methods. In conclusion, the author makes some speculations concerning the future civil requirements for uranium.

In the second paper, J. Bruce Clemmer described an " Application of solvent extraction in processing uranium ores " (VII : 2) in which he gives a brief review of the laboratory and pilot-plant work done at Salt Lake City for the Atomic Energy Commission. Various solvents were mentioned, and it was stated that there is a definite trend towards the use of solvent extraction.

" The influence of fluidized roasting on hydrometallurgical processes " (VII : 3), by J. D. Grothe and B. H. McLeod, shows how the fluidizing technique has enabled metal to be recovered from ores and concentrate which were once regarded as difficult to treat.

In " Investigations of the chlorination of non-ferrous metal ores " (VII : 4), by G. Jangg, L. Pötz and E. Schmiedl, the authors discussed the role of chlorination processes, various theoretical aspects and the application to sulphide and other ores. Mr. Doughty (G.B.) reminded the Congress of the considerable work which had been done on chlorination of tin ore some years ago and that commercial operations had been carried out.

The last section consisted of two papers only, " Simple microscopy for plant control in mineral dressing," by E. Cohen, and " A new spectometric technique for analysing fine ground material ", by A. Danielsson ; neither of these papers was presented by the authors or discussed.

The Place of the Tractor-shovel in Today's Mine

A cost-saving machine for the mine operator in to-day's search for efficiency is the tractor-shovel, or front-end loader, offering ability to perform a variety of useful jobs in mining operations. This adaptable machine is being assigned more and more demanding tasks around both open pit and underground mines as management becomes acquainted with the many benefits offered by the general-purpose machines. The author of this article is Mining Representative, Sales Development Division, Caterpillar Tractor Co., Peoria, Illinois

THE hydraulically-operated tractor-shovel of to-day is a specially-designed unit, rugged, mobile and productive. Loaders are planned from the track shoe bolts up to be capable of withstanding stresses of the most demanding working conditions. Because they must stand up under superimposed loads, loaders are usually stronger than their standard crawler counterparts. Heavier track frames and stronger main frames are regular components of most tractor-shovels. This rugged construction gives the loader ability to handle work that other machines are unable to stand.

The tractor-shovel is a machine designed to do more than one job. Not only can it do shovel work, it also has the built-in ability to operate as a crawler tractor. As a shovel, the loader is not limited to a confined area of application. Manufacturers are constantly extending its range of duties through the design and marketing of tools and attachments which adapt the machine to entirely new situations. There are tools available which outfit the tractor-shovel for almost any mining job that can be performed by a loader or a conventional crawler.

The prime tool for any tractor-shovel is the bucket, and a variety is available, from the highly specialized light materials bucket to the rugged quarry unit. Light materials buckets are for use in loose, light-weight materials and have a larger capacity than the heavy-duty units.

Quarry buckets, rigid and able to withstand heavy, continuing shock, are designed to fill special needs in quarrying and mining. Tough teeth, welded to the cutting edge, protect the edge and help ease loading in jumbled rock. The advent of very strong tools of this type, coupled with development of lever prying action from the bucket tilt-back, enables the tractor-shovel to break loose extremely stubborn metal. By utilizing this ability the owner can work his machine in areas never attempted before. Rugged jobs can be found at almost any mine.

Also available for the tractor-shovel are specialized attachments which are fitted to particular requirements, such as the skeleton rock bucket which grades material size as it digs it from the ground.

Above: One of the tools designed to extend the tractor-shovel's versatility is the skeleton rock bucket which grades the size of material as it is removed from the ground. The scope of the tool opens wide possibilities

Below: A tractor-shovel is used as the main loading unit at a mine

A recent innovation in bucket design is the side-dumping model. Hinged at the side of the bucket frame, the side-dumper can pick up a load and, without turning, cast it sideways into the bed of a haul unit. Because it casts to the side as well as forward, parallel loading is made possible. That is, the truck parks beside the loader which has only to back away from the stockpile and dump to accomplish its job. No turning is necessary; as a result, the side-dumping bucket lowers loading time per unit, and maintenance cost, thereby reducing the cost of operation. This type of unit is ideal for work where manœuvring area is limited.

Because of the wide range of tools available, the tractor-shovel offers almost unlimited versatility to mines, large or small. It can work as a production loading tool by loading haulers rapidly and efficiently. Many smaller mines make use of the tractor-shovel as the primary loading unit for the entire mine operation. At one site, a tractor-shovel loads material into the crusher hopper, then loads the prepared material into trucks from stockpiles. This unit is also used for general-purpose work around the area.

A tractor-shovel is well suited to operation around the large loading shovels, by cleaning ahead of the big unit and then stacking or loading trucks with material spilled or missed during regular loading. An Indiana pit uses a tractor-shovel to clear for the loading unit and to push loose material to within reach of the big shovel. A big advantage is ability to move from job to job rapidly. Highly manœuvrable in comparison to the large shovels, the tractor-shovel can rapidly shift to another work area at up to 7 m.p.h. Large units are limited to a particular area by slow speeds and bulk, making the tractor-shovel fit in as a general-purpose machine.

Around the mine there are scores of jobs that can be handled by a tractor-shovel in off-time. Because of its ability to pick up items and reach into the air, the tractor-shovel can act as a mobile hoist. At a Missouri mine a loader is used to raise large, heavy parts to places where they are needed. Over six tons can be lifted by these machines. In this mobile hoist capacity the loader again cuts down costs.

Above: Underground the tractor-shovel can perform many of the tasks that it can do on surface and, in addition, handle many operations peculiar to underground mines. Scrubbers overcome exhaust gases

Below: A recent development to extend the tractor-shovel's range of duties is the side-dumping bucket

In addition to these different uses as shovel and hoist, the loader can do much of the work performed by a conventional crawler at the mine site. Manufacturers have designed special bulldozer blades which fit the arms of the loader. Either straight or angling blades are available and the machine can be converted to bulldozing or back to loading in a few minutes' time. With the blade, the loader can do routine bulldozing activities, such as light spoil removal, road building, land clearing and even haulroad grading. To-day's machine and its hydraulic system are built to withstand the rigours of this type of work without damage.

By W. A. HALEY

Rear-mounted rippers help to break up material for later removal by the tractor-shovel's bulldozer or bucket. Cover can be loosened in a few passes, then loaded into haulers by the bucket. The tractor-shovel can exert great pressures to drive the teeth into the material to be ripped because of a greater weight than its crawler counterpart. By mounting the teeth backwards in the carrying bar, material can be ripped while the machine is backing up to get a new load in the bucket, cutting time and expense.

By hooking a scraper to the drawbar, the tractor-shovel is converted to a prime mover and can double as a production unit by loading the scraper and hauling ore to the grizzly. The scraper is easily removed or added, making it a matter of minutes to convert to or from a prime mover.

Underground, the tractor-shovel can perform many of the jobs that it can do above ground and, in addition, handle many operations peculiar to underground mines. With two to four drills mounted on the bucket frame, the loader can drill high spots easily because of its high-reaching arms. By replacing the bucket with a platform, the tractor-shovel can be used as a special mount for roof-bolting crews.

Manufacturers have overcome the initial problem of the diesel exhaust gases in underground mines by the use of scrubbers which cool and dilute exhaust gases. With a scrubber and adequate ventilation, a diesel tractor-shovel can operate below ground 24 hours a day without causing ill-effects to personnel. In gaseous atmospheres, owners have utilized the loader's versatility by removing the engine and installing electric motors.

Congress Delegates at Blind River and Sudbury

A report from Yellowknife, giving some impressions of British Columbia and the Yukon as seen during the northern aerial tour organized by the Sixth Commonwealth Mining and Metallurgical Congress, appeared in our issue of September 27, 1957, p. 361.

SINCE leaving Yellowknife the delegates have visited uranium mines in Uranium City, Northern Saskatchewan, Lynn Lake in Northern Manitoba and smelting operations at Flin Flon. West of the Manitoba border the itinerary has taken them to some of Ontario's great mining camps, including a visit to the huge iron ore operations at Steep Lake—one of mining's most notable achievements—which were described in a recent issue of this journal (9/8/57, pp. 162 and 163). On Sunday night, September 22, the party arrived at Sault Ste. Marie. Some delegates remained there next day to visit the plants of Algoma Steel Corporation, while the rest proceeded to Blind River.

By a happy coincidence, the delegates were in the Blind River - Elliot Lake district at the time when the largest single mining and milling operation of uranium ore in the world—that of Consolidated Denison Mines—came into production. On Saturday, September 21, the first carload of ore was treated by the 6,000-ton capacity mill, bringing to fruition four years of surveying, planning, drilling and construction.

The original staking of the Consolidated Denison property at Quirke Lake was carried out during the summer of 1953 and exploration was started in the following year. During geological mapping of the claims, a flattening of sediments was noted along the west shore of Quirke Lake and across the islands to the south-east. It was concluded that this flattening was a surface expression of an old beach or river bed. This structure, when projected northwest, coincided favourably with drilling results obtained on the adjoining property to the north. A drilling programme was carried out with this formation in mind and disclosed the existence of a very large tonnage of payable ore. By March, 1955, the tremendous extent of the Denison orebody had become apparent. A contract for shaft sinking was placed in the following month. Senior financing to the extent of $22,000,000 was secured to place a 3,000-ton mill into operation and negotiations for a contract covering the sale of uranium precipitates were begun. Mid-1957 was set as the target for the commencement of production.

Milling and Mining

In June, 1955, the results from the drilling programme began to indicate the desirability of a much larger mill. Shareholders accordingly approved an increase of 1,000,000 shares in the company's authorized capital at $1 par value. With the increased funds so obtained, plans were initiated for the present 6,000-ton mill. On August 19, 1955, the signing of the contract with Eldorado Mining and Refining Ltd. was announced. Increased to $201,895,000, it provides for the sale of uranium precipitates to the Dominion Government agency during a period now extended to March, 1963.

The milling and mining operations have been planned to expand to a capacity of 10,000 tons a day, with minimum capital outlay. Proved ore reserves exceed 136,000,000 tons, grading 0.139 per cent uranium oxide per ton. They are greater than the total reserves of all the uranium mines in the U.S.

The flat-lying orebody permits of trackless mining, all workings being in ore. The undertaking is completely mechanized and constitutes virtually "push-button mining". Drilling on all faces is carried out with four-boom "drill-mobiles". Mechanical loading ramps gather and dump ore into 18-ton capacity shuttle cars, which discharge on to conveyor belts carrying the ore to the loading pockets at the shaft.

Indicative of the magnitude of the treatment plant is the fact that the area of the concentrator alone is 5½ acres. Total tank capacity is 6,000,000 gals. and total pumping capacity 80,000 gals. per min.

Consolidated Denison is the fourth uranium mine in the Blind River-Elliot Lake area to come into production, the others being Pronto, Algom-Nordic and Algom-Quirke. Moving rapidly out of the development stage are Buckles, Lake Nordic, Stanleigh, Can-Met, Milliken, Spanish American, Stanrock and Panel.

Touring The Areas

Mining delegates made an underground tour of Consolidated Denison in the morning. In the afternoon they inspected the surface plant at Can-Met and saw the crushing and grinding chamber at Stanrock in operation. Metallurgical delegates saw the surface plant and concentrator at Pronto and the concentrator at Algom-Quirke. Geological delegates visited the surface outcrop at Pronto in the morning, followed by an underground tour of Algom-Nordic. In the afternoon they were taken by boat on Quirke Lake, along the geological cross-section.

Franc R. Joubin, discoverer of the mineral which made the area world famous, was chairman of an informal dinner at Blind River for all the delegates. The party then left for Sudbury by special trains.

The Sudbury Basin is, of course, one of Canada's most important mineral-producing areas, being the home of International Nickel, Falconbridge, and various smaller companies. During 1956, mines in the area produced 94 per cent of Canada's nickel and 76 per cent of the Free World's supply. Inco also ranks fifth among the world's copper producers and its other products include platinum metals, gold, silver and tellurium, as well as alloys and by-products.

The programme for delegates included a tour of Inco's operations, an underground inspection of the Falconbridge operations, and other tours taking in the Inco reduction and refining plants, Creighton Mine, and the Frood-Stobie open pit, as well as Falconbridge's Fecunis Lake Mine and surface installations.

The day concluded with a reception and dinner. Chairman at the dinner was Mr. R. H. Waddington, assistant to the vice-president of Inco. The guest speaker was Mr. R. D. Parker, vice-president and general manager of Inco's Canadian operations.

Machinery and Equipment

ADVICE ON COMPRESSED AIR

An important feature of twentieth-century industrial enterprise, indeed a paramount need if sales are to be maintained by the manufacturer, the after-sales service demands no less attention than manufacturing standards themselves. It is significant that after-sales service is receiving marked attention in the endeavours being made at the moment to establish a widening market for British mining equipment in Canada.

It is pleasing to record, therefore, that Holman Bros. have already established a service that progresses beyond the normal after-sales type of enterprise. To advise and assist operators faced by problems concerned with compressed air, these manufacturers have developed and operated for some time a complete technical and advisory service of a specialist nature for compressed-air users. The service applies particularly to the mining, quarrying, and civil engineering industries, and passes beyond the information normally provided by manufacturers about the capabilities of their equipment.

It is a two-way service that brings manufacturer and user intimately into contact.

AUTOMATIC CONVEYOR CUT-OFF

A system has been developed in the South-western Division, National Coal Board, which will automatically cut-out the power supply to the motor of a belt conveyor if for any reason the belt should stall.

The illustration shows the arrangement of the system when the belt is in motion. The lever *C* has a tendency to drop under its own weight, thus actuating the valve *E*; it is prevented from dropping, however, by one of the lugs *D*. It rests on one or other of these lugs, according to the direction of belt travel.

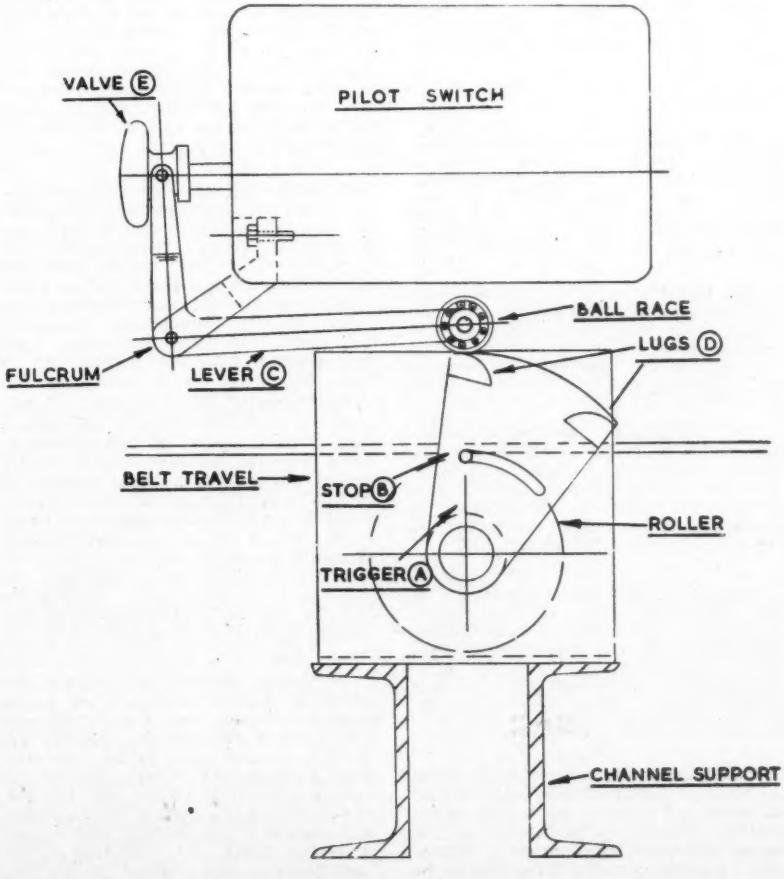
The lugs are welded to the triangular plate *E* which acts as a trigger for the system. This plate is attached to the spindle of a specially adapted roller which applies torque to the trigger when the belt is moving at normal speed. This torque in conjunction with the stop *B* ensures that the lugs *D* are correctly positioned to sustain lever *C*. When the belt stops, or slows below a predetermined speed, the torque is removed and the cam-shape of the lugs allows lever *C* to drop, actuating valve *E* to cut off the power supply. The valve *E* can be made either to close the air supply to the driving motor or to actuate a pilot switch, according to the type of motor used.

An essential feature of the device is the adaptation of a standard oil-filled roller to enable it to transmit torque to the trigger *A*. Six paddle-vanes are welded to the inner circumference of the roller parallel to the axis and along the entire length of the roller: four further paddle-vanes are welded to that length of the spindle which is inside the roller. There is a clearance of one-sixteenth of an inch between the outer and inner vanes as the roller rotates. The roller is filled with heavy gear oil. When the roller rotates under the action of the moving belt, the vanes attached to it cause the oil to exert a force on the vanes attached to the spindle; this force is transmitted to the trigger *A*.

Above: The Moto Loader

NEW FRONT-END LOADER

The Thew Shovel Co. has announced production of the first model of its new line of rubber-tyred front-end loaders. Thew's new line of product has been named Moto-Loader and the first model



Opposite: Automatic Conveyor Cut-off

announced is a four-wheel drive, 1¼-yd. capacity unit, designated Model ML-153.

The new ML-153, available with either petrol or diesel power, utilizes an Allison Torqmatic 3-speed, power-shifted, full reversing transmission and integral torque converter with a 2.5-to-1 ratio. Top speed is 21.4 m.p.h. Use of the integral torque converter provides an infinite number of "gear" ratios in each speed range. Shifts can be made into any of the three operating ranges under full power. Planetary axles are used both front and rear.

An entirely new concept for travel direction selection and throttle control is introduced on the new Moto-Loader. Two adjacent foot pedals—one for forward travel and one for reverse—give the operator instant direction control, with one foot, while the other foot is used for braking. This frees both hands for steering and hoist and bucket controls, giving the ML-153 extreme ease of operation and precise control throughout the loading and digging cycle. Another new feature of the ML-153 is the automatic disengagement of the transmission when the foot-controlled service brakes are applied. When the brakes are released, the transmission automatically returns to the gear range in which the loader has been working. This new feature permits exact inching of the load and eliminates excessive strain and wear on the drive line components.

Hydraulic controls are mounted on the dash with a toggle hoist lever to allow constant hoisting force while the operator manipulates the bucket-tilt control for quick breakout action. Two double-acting 5-in. dia. chrome-plated hydraulic cylinders are provided on both hoist and bucket-tilt mechanisms to give optimum lift and breakout power co-ordinated with speed of the loading cycle. The hoist arms and stabilizer bars are designed for operating-safety. Operator's position and the front cowl have been designed to allow full working visibility at all positions of the bucket from ground level to full raise and dump. Bucket rollback at carry position is 40 deg. Forward reach at 7 ft. dumping height is 40 in. The peak lift capacity of the new Moto-Loader is 11,000 lb. at 0 m.p.h. with a carrying capacity of 6,000 lb. at 4 m.p.h.

ORDERS FOR MINE WINDERS

Amongst several important orders which the British Thomson-Houston Co. has in hand for the N.C.B. are two 3,300-h.p. Ward Leonard 4-rope friction winders for Wolstanton Colliery in North Staffordshire; a 1,200-h.p. Ward Leonard 4-rope friction winder for the No. 2 shaft of Grimethorpe Colliery in Yorkshire; a 1,800-h.p. induction-motor-driven 4-rope friction winder for Cotgrave Colliery in Nottinghamshire; and a 1,050-h.p. 4-rope friction winder also driven by an A.C. induction motor for Daw Mill Colliery in Warwickshire.

All the above equipments will be located in towers built directly over the winding shafts. The Ward Leonard winders will incorporate closed loop control and those for Grimethorpe and Cotgrave collieries include B.T.H. speed-reduction gearboxes. For those winders driven by induction motors the speed will be controlled by metallic resistances in the rotor circuit operated through contactors.

In addition to the above, B.T.H. has obtained several orders for conventional drum winders.

MINING MISCELLANY

The discovery in Israel has been reported of traces of niobium and tantalum, the extent of which is not yet known.

★

Work is proceeding on the construction of a big metallurgical raw materials factory at Gornik, Poland. Scheduled to start production in 1959, it will produce aluminium oxide, using minerals which are found in large quantities in Lower Silesia.

★

The Ministry of Agriculture, Brazil, has been granted a special credit of Cr.10,000,000 for mineral prospecting in the State of Bahia. Deposits of lead, copper, manganese, iron ore, and other minerals are believed to exist in workable deposits.

★

The tungsten mine in Tjaellmo, near Linkoeping, south of Stockholm, is to be closed down from the end of the year. Reasons given are the present low prices for tungsten and also that the mine is virtually worked out.

★

The Colombian Association of General Engineering, Ltd., representing the French companies, J. Lobet and Karlwich, are reported to have made a proposal to the Colombian Government for financing the systematic exploration of the coal reserves of the Valle.

★

During the first year's operations at the Mestersvig lead and zinc mines, Greenland, 13,650 tons of zinc concentrates and 8,750 tons of lead concentrates were shipped to purchasers in West Germany and Belgium. Under normal weather conditions, the mines can operate for ten months a year.

★

Pravda reports that the Central Asian republic of Kazakhstan is being looked to more and more as one of the richest mineral areas of the Soviet Union. The paper claims that the reserves of chrome and vanadium ores are the largest in the world, while those of copper, lead, zinc, silver, cadmium, and wolfram are the largest in the Soviet Union.

★

A group of executives from the Japanese Nippon Mining Co., led by Mr. Kennosuke Kawaguchi, is making a tour of the provinces of Antofagasta and Atacama, in Chile, to study the possibility of buying a copper mine and establishing an ore-treatment plant in the area. Mr. Kawaguchi said his company was ready to invest up to $30,000,000 in the project.

★

A $32,000,000 loan has been obtained for the Tata Iron and Steel Co.'s expansion programme and will meet the programme's foreign requirements. The company will get $17,500,000 from the World Bank pending the approval of the Bank's board, with the remainder coming from American commercial banks. A $75,000,000 loan had previously been obtained from the World Bank.

★

Production at the Mangula copper mine is expected to reach an annual rate of 14,500 s.tons of copper concentrates (50 per cent copper content) by the end of this year, it has been announced by the Messina (Transvaal) Development Co. This involves the production of some 1,700 s.tons of ore per day. Any shortfall of newly mined ore can be made good from the 150,000-ton stockpile. In 1959, concentrate production is planned to reach 26,000 tons a year with ore output running at 3,000 s.tons per day.

★

The capital of Miferma (Société des Mines de Fer de Mauritanie) is to be increased from Frs. 825,000,000 to Frs. 4,000,000,000 by the end of this year. As a result, the British Iron and Steel Corporation's interest will be increased from 14 to 20 per cent. German and Italian steel interests' participation will remain at 10 per cent and 15 per cent respectively. The remaining 55 per cent interest will continue to be held by French groups. In about 12 months' time the capital will be increased to between Frs. 20,000,000,000 and Frs. 25,000,000,000. More foreign participation will probably be invited. Miferma was formed in 1952 to survey and work the iron-ore deposits at Fort Gouraud, where reserves have been estimated at some 120,000,000 tons of ore with a metal content of between 60 and 70 per cent.

★

Copper production at the Kilembe mine in Uganda was at record levels in August and September and exceeded 1,000 tons of blister in each month. This high production rate is likely to continue for another ten or eleven months, when existing stockpiles of concentrates at the mine will be exhausted. Probably output will then drop back to 750 tons a month. Geologists are carrying out further surveys in the Kilembe area in search of additional deposits of ores. Kilembe mines have now been in operation for a year.

★

Thanks to continued high water in the Orinoco River, Venezuelan shipments of iron ore have been maintained at an increased level and this year's production target of 15,000,000 tonnes (12,000,000 tonnes from the Orinoco Mining Co.) may well be reached. On the other hand, the activities of the Upata Mining Co. have not fulfilled expectations, owing to lack of capital, and this company's manganese mining operations have ceased for the present. A reorganization is in prospect.

★

The main feature of next year's centennial celebrations in British Columbia will be an International Trade Fair, to be held at Vancouver in May. A special invitation is extended to British firms to make this fair their shop window. Well over $500,000,000 worth of various commodities passed through the Customs ports of British Columbia last year and the Province is reported to be more ripe than ever for business. The cost of space

Lining up for the final parade and grand salute at the IH demonstration at Hemel Hempstead. Twelve IH construction machines on tyres and tracks, most of which are now made, or will be shortly, in Great Britain

at the Fair has been set at the nominal price of $1.50 per sq. ft. Firms interested should apply to the Agent-General at British Columbia House for further particulars.

★

A report from Salisbury states that the Southern Rhodesian mineral industry appears likely to reach the target of £25,000,000, set by the Minister of Mines, as the value of its production, at mine, this year. On an at-mine valuation, the production of all minerals in the Territory exceeded £12,500,000 in the first six months of the year. The Ministry of Mines, Mr. Cyril Hatty, has stated that, given a stable market, chrome will oust coal as the Colony's third highest mineral revenue-earner in 1958. Asbestos is expected to retain first place and coal second.

★

The Dutch vessel *Unitas* has left Arklow, County Wicklow, Eire, with a cargo of copper ore from the Mogul subsidiary, Saint Patrick Mining Co., Ltd., of Avoca. The shipment, amounting to 350 tons, was consigned to Amsterdam for smelting and processing. It was the first shipment from the Avoca Copper Mines since they were acquired by Saint Patrick Mining Co., Ltd., more than 18 months ago.

★

On October 9, contractors, civil and municipal engineers and builders from all over the British Isles drove into Hemel Hempstead New Town to see one of the biggest construction equipment demonstrations ever staged in this country. The 400 people present, among whom were also Government officials and members of the Services, were guests of International Harvester Co. of Great Britain, Ltd., leading tractor and equipment manufacturers. Shown in eight different rôles, the International BTD-6 surprised many of those present with its versatility and high efficiency in dozing, scraping, loading, grading, grubbing, and otherwise moving earth. Climax of the show was the first presentation to the public of the big 124 b.h.p. crawler tractor with Rolls-Royce engine which I.H. is to manufacture at Doncaster next year. Rounding out the display were giant I.H. earth-movers from America: the Hough HOD 4-wheel-drive loader made by an I.H. subsidiary, the huge 75 Payscraper, and the biggest of all International tractors, the TD-24.

PERSONAL

Mr. Jack Thomson, formerly general manager, has been appointed a director of Roan Antelope Copper Mines, Ltd. He has also joined the London Advisory Committee of Mufulira Copper Mines, Ltd., and of Chibuluma Mines, Ltd. All three companies are part of the Rhodesian Selection Trust. Mr. Thomson will shortly be appointed head of the Rhodesian Department of the Selection Trust.

★

Mr. G. V. White has joined the board of East Geduld Mines, Ltd.

★

Mr. William T. M. Browne has been elected a director of the Bisichi Tin Co. (Nigeria), Ltd.

★

Mr. J. Ortiz-Linares and Mr. J. Ivan Spens have been appointed directors of Consolidated Tin Smelters, Ltd.

★

Mr. Lewis Chapman (chairman, William Jessop and Sons, Ltd.) has been appointed president-elect of the British Iron and Steel Federation in succession to the late Mr. Gerald Steel. Sir Andrew McCance (chairman and managing director, Colvilles, Ltd.) has been invited to continue as president for 1958.

★

The death has occurred of Mr. Edgar L. de M. Mocatta, who had been a director of Mocatta and Goldsmid, Ltd., since its formation, and who was a partner in the firm of Mocatta and Goldsmid from 1900.

★

Sir Arthur F. B. fforde has been appointed a director of Westminster Bank, Ltd.

★

Mr. G. M. Keightley has been appointed manager of the British Sales Division of Consolidated Pneumatic Tool Co., Ltd., with Mr. R. E. Bayliss as assistant manager.

COMPANY EVENTS

The anchorage of cables in rock is a well-known practice, but hitherto very little has been known about anchorage in other classes of substrata. The Cementation Co., Ltd., has now developed a method of anchorage in chalk and in clay which has shown such good results that the technique will be applied in future Cementation Co. activities. A patent is pending.

★

The formation of Allis-Chalmers International as a major operating division of the Allis-Chalmers Manufacturing Co. has been announced. A.-C. International will be responsible for all manufacturing, engineering and sales operations and activities outside the United States and Canada.

★

The British Standards Institution has announced publication of the new British Standard for troughed belt conveyors (B.S. 2890:1957).

★

The Ad Hoc Working Party on Contract Practices in Engineering of the Economic Commission for Europe has completed drawing up two sets of "General Conditions for the Supply and Erection of Plant and Machinery for Import and Export". The Working Party is now to consider the advisability of drawing up general conditions applicable to the erection of machinery without its supply.

CONFERENCES AND EXHIBITIONS

The International Congress and Exhibition of Measuring Instruments and Automation (Interkama) will be held in Dusseldorf from November 2 to 10, 1957. There will be 173 exhibitors from Germany and 143 from other countries.

★

Dr. E. C. Ellwood, chief metallurgist of the Tin Research Institute, has left London by B.O.A.C. for New York to represent the Institute at the Second World Metallurgical Congress, which opens in Chicago on November 2. The Tin Research Institute is exhibiting at the American Metal Show, which is being organized in conjunction with the Congress. While in the United States, Dr. Ellwood will visit other centres, as well as the Tin Research Institute's American office at Columbus, Ohio, to study recent American developments.

CONTRACTS AND TENDERS

Turkey

TEN/28500. The International Cooperation Administration (I.C.A.) has announced the following procurement for Turkey: One diesel engine powered core drilling machine for mining, complete with water pump and accessories, for drilling up to 100 metres with diamond drill bits. P.A. No.: 77-740-99-h8-7232. Bid deadline, 25/10/57. Buyer, Maadin Arama ve Isletme Turk, Ltd., Sirketi, Istanbul, Beyoglu, Istiklal Caddesi, Balyos Sokak Yeni Han Kat 2, No. 18-21. B.O.T. Ref.: E.S.B. 24398/57 I.C.A. Telephone enquiries to Chancery 4411, extension 354.

Metals and Minerals

Growing Competition for Aluminium Markets

By the end of 1956 the supply of aluminium had been brought into approximate balance with demand and producers were at last in a position to embark upon aggressive policies of sales promotion. Circumstances have not been propitious, however, for declining demand has caused the pendulum to swing rather more rapidly than anticipated in the reverse direction, though there are now indications of a firmer trend.

In the U.S., domestic aluminium sales during the fourth quarter are expected to fall below the level of the corresponding period last year, despite the probable seasonal upturn. Even an anticipated 5 per cent increase in the final three months will not erase the more-than-seasonal drop of 7 to 8 per cent in the previous quarter. It has been forecast that the total U.S. supply next year (including imports and secondary grades) will be 2,850,000 s.tons—an increase of 500,000 s.tons from the current year. This points to a surplus of 500,000 tons, since demand is expected to rise by 250,000 tons over the 1957 level, which has been placed at 2,100,000 tons.

Based on the more encouraging outlook for the fourth quarter, however, the more optimistic prediction was recently made that the present gap between supply and demand would not be increased next year, and might even be narrowed slightly. One view is that it will probably amount to about 350,000 tons, remaining at about the same level in 1958 despite new production. Demand is expected to be close to supply by 1960.

Adding to the present difficulties of U.S. producers is large-scale competition from abroad, which is expected to continue in the fourth quarter, notably from West Germany, Britain, Italy and France. It was estimated that imports of aluminium sheet during the first three-quarters of this year totalled 8,500 s.tons, and these were at prices 4 - 4½ c. under domestic quotations. The American industry is trying to meet this competition with plans to expand its own export markets and to promote new uses for the metal in the U.S., such as broader packaging applications, including aluminium cans.

On the export side, it is noteworthy that Capitol Products Corporation, a leading U.S. fabricator which participated in the Vienna Trade Fair last month, is impressed with the prospects of Western Europe as an expanding outlet for aluminium building products, and doubtless this market will also be carefully studied by other U.S. firms.

The industry is counting on transportation, particularly in the automotive segment, for an increased demand during the remainder of this year and also in 1958. Buick's 1958 models, it has been announced, will use nearly twice as much aluminium as this year's. Strong gains are expected in building projects and in the electrical field. In the latter connection there is encouragement in the fact that, so far, the reduced price of copper appears to have made no material difference in aluminium requirements; e.g., for electrical conductors.

The short-term outlook has been improved by the U.S. Government's decision to order an additional 7,700 s.tons of aluminium to be set aside for defence use in the January - March quarter of 1958. The latest allocation, ordered by the Commerce Department's Business and Defence Services Administration, is designed to reserve this quantity of the light metal for producers requiring it under the priority system to make civilian-type items used by the armed services. The B.D.S.A. set-aside is on top of the 59,500 s.tons reserved by O.D.M. for the production of purely military items in the first quarter of 1958.

Technologically, the most interesting development is the advent of a new lithium-alloy for aircraft construction, which is regarded as a major scientific achievement. Besides being 3 per cent lighter than the aluminium alloys previously used in aircraft, this new material will maintain high strength up to 400 deg. F., thus raising by more than 100 deg. the thermal barrier which has hitherto limited aluminium's applications in supersonic aircraft. Alcoa, the company responsible for its development, is prepared to produce the alloy in commercial quantities. It remains to be seen how far it will be capable of competing with titanium and also with Armco's new stainless, which can withstand aeroplane skin temperatures up to nearly 1,000 deg. F. Besides being more expensive the latter materials are, of course, heavier, which is an obvious disadvantage for aircraft construction.

More intensive competition in world markets must be expected from Canada, now that the Kitimat dispute has been settled. United Steelworkers of America have voted to accept a three-year pay contract providing for an increase of 5 per cent on all wage rates plus 8 c. an hour. Since the long strike at Arvida is over and a settlement has been reached at Kitimat, Alcan can look forward to efficient production at all Canadian works and plans to speed up the development of overseas markets. The company expects to maintain its sales in the U.S., while demand in the U.K., after declining earlier this year, now appears to be improving.

BAUXITE OUTPUT RISING

World production of bauxite in 1956 continued the upward trend which has been unbroken since 1951, reports the Bureau of Mines, U.S. Department of the Interior, reaching a total of 17,400,000 l.tons, which is an approximate increase of 6 per cent over 1955. Surinam continues to be the largest producer of bauxite ore, output rising to 3,427,500 l.tons last year from 3,013,600 in 1955. Jamaica holds second place with a 1956 output of 3,141,300 tons, compared with 2,645,300 tons in 1955. British Guiana, third ranking producer, mined about the same amount of bauxite in 1956 (2,481,000 tons) as during the previous year.

★

The Queensland Government has approved in principle the granting of a franchise for the development of the rich Cape York Peninsula bauxite field to the Consolidated Zinc Corporation. The discovery of these deposits was, perhaps, the outstanding development of last year.

★

Mr. K. A. Gbdemah, Finance Minister of Ghana, while on a visit to London has discussed with the Chancellor of the Exchequer, Mr. Peter Thorneycroft, the problem of financing the Volta River hydro-electric and aluminium scheme. He stated on arriving in London that Ghana and Britain considered themselves partners in the project. While in Canada recently Mr. Gbdemah intended to discuss the Volta scheme with Aluminium Ltd., but it is not known what success he may have had in these discussions.

RUSSIAN CHROME FOR U.S.

It is reported from New York that heavier shipments of Russian chrome ore are due to enter the U.S. via Canada. The total appears to be large enough to have a definite impact on the market situation in the U.S. The Russian ore in most cases is about 49 per cent Cr_2O_3; some of it is as low as 48 per cent and some as high as 51 per cent. The ratio in some cases is 3 to 1, but often 2.9 or even 2.8. Generally the ore is classifiable as hard, lumpy, though often it contains 25 per cent or more of fines. Meanwhile, the U.S. market for chrome ores remains uncertain.

According to the Bureau of Mines, U.S. Department of the Interior, domestic chromite consumption during the first six months of 1957 was 2 per cent higher than in the first half of 1956. The metallurgical industry consumed 638,515 s.tons (47.1 per cent Cr_2O_3) against 598,492 tons (46.8 per cent Cr_2O_3) in the corresponding period of 1956, but the refractory and chemical industries used 6 and 7 per cent less, respectively.

Consumption of chromium alloys and metal during the second quarter of 1957 dropped 18 per cent below the first quarter. Comparing the first six months of 1957 with the same period of 1956, consumption decreased 7 per cent. Stocks on hand at consumers' plants at the end of June, 1957, totalled 21,623 s.tons.

★

Southern Rhodesia hopes to raise its exports of chrome ore to about 1,000,000 tons annually in the next two years, states the Secretary for Mines, Mr. C. L. Honey. Last year the Colony's chrome mines produced about 450,000 tons of ore. Provided the world market remained stable, said Mr. Honey, the country might achieve a total output of about 800,000 tons in 1958 and about 1,000,000 tons in 1959.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

All prices have shown a substantial change in the downward direction although by the middle of the week a slightly firmer undertone had developed which was attributed to the growing realization that the political situation in the Near East was far from being settled.

VIEWS ON COPPER DIVERGE

The copper market has now reached a point where there is a distinct divergence of opinion between those who base their opinions on charts and those who take a very broad view of the copper situation as a whole. The former are convinced that with the establishment of a new low point for cash copper the present downward tendency in the market will continue and the price of £165 per ton which they were mentioning some weeks ago is still a certainty. The latter see signs that production is being cut back sufficiently to equal current consumption, and provided that there is no overall industrial recession in the next few months, the price should firm up from its present level as it is an established fact that consumers have cut back inventories to danger point and any period of stability in the price would bring them in as buyers.

The latest statistics available lend weight to the latter point of view.

The market in London has had little of local significance to influence it except that the contango has remained steady at about the £4 level with stocks showing almost no change over the previous week. In America, custom smelters surprisingly cut their price by ½ c. to 25½ c. per lb. on Tuesday, the reason given being the weakness in London and the Belgian producers' action in making two price cuts in a week. It is not generally believed, however, that this cut is the forerunner of a general lowering of the price structure, as producers appear to be satisfied with the volume of business already booked for October. The custom smelters' action was even more surprising, as it is understood that except for last Friday, offerings of scrap have been on a very small scale and even in present market conditions smelters could have had little difficulty in getting rid of their intake.

TIN BACKWARDATION OUTLOOK

As forecast last week, with the continued fall in the Eastern price, pressure continued on the forward quotation in London and a backwardation of up to £4 per ton was established and this was helped by an appreciable reduction in the stocks of 171 tons during the previous week. The tonnage of cash tin which changed hands at £730 per ton presumably passed into the control of the Buffer Stock Manager, but by the middle of the week the price was once again above the support point. The possibility that sales of forward metal will continue to press upon the market has given rise to many calculations as to the lowest figure which is likely to be reached, based on the cash price in London of £730 per ton. Although the majority think that a backwardation of about £5 is unlikely to be exceeded, a few experts consider that the span can become as great as £10 per ton. On Thursday morning the Eastern price was equivalent to £731½ per ton c.i.f. Europe.

UNSETTLED LEAD-ZINC MARKETS

The lead market, which had been remarkably steady for some time, was faced on Friday with the news that the British Government intended to dispose of the whole of their remaining stocks of lead amounting to 20,000 tons at a monthly rate not likely to exceed 3,000 tons and commencing in December. This news was entirely unexpected. It is now clear that the government are selling all their stocks of lead and this fact must hang as a shadow over other markets for, as far as is known, the government have additional tonnages of all the other three metals in excess of the projected disposals already announced.

The sharp fall in London was followed by a reduction in the U.S. of ½ c. per lb. to 13½ c. per lb. New York, with some buyers withholding orders in the hopes that a further decline might take place. The latest available statistics from America seem to indicate that the output of lead is falling slowly and that although stocks are still high, a near balance has been achieved between production and consumption and the probability is that any tariff increase will be followed immediately by a raising of the domestic price.

Fundamentally, the zinc position is the same as that for lead although in this metal the difference between production and consumption which had be bridged was initially far greater.

The market in London has declined largely in sympathy with the lead and copper prices, but surprisingly there has been no talk of a reduction in the U.S. price although stocks there still continue to rise with the tonnage held by smelters on July 31 being more than double that held on January 1 of this year, and as consumer stocks also showed a large increase the position must still be regarded as very vulnerable.

Closing prices and turnovers are:

THE WEEK ON THE L.M.E.

	Oct. 10		Oct. 17	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£188	£188½	£184	£184½
Three months	£192	£192½	£188	£188½
Settlement	£188½		£184½	
Week's turnover	5,925 tons		9,825 tons	
LEAD				
Current ½ month	£87½	£87½	£85½	£85½
Three months	£87½	£88	£85½	£85½
Week's turnover	2,175 tons		4,375 tons	
TIN				
Cash	£730	£730½	£731	£731½
Three months	£732	£732½	£728	£729
Settlement	£730½		£731½	
Week's turnover	730 tons		945 tons	
ZINC				
Current ½ month	£69½	£70	£68	£68½
Three months	£69½	£70	£68½	£68½
Week's turnover	4,425 tons		5,125 tons	

LONDON METAL AND ORE PRICES, OCT. 17, 1957

METAL PRICES

Aluminium, 99.5%, £197 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60%) basis 20s. 0d./21s. 0d. nom. per unit, c.i.f.
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 3d. lb.
Cerium (99% nett), £13 18s. lb. delivered U.K.
Chromium, Cr. 99% 7s. 2d. lb.
Cobalt, 16s.-19s. lb.
Germanium, 99.99%, Ge. kilo lots 3s. 4d. per gram
Gold, 249s. 8½d.
Iridium, £27/29 oz. nom.
Lanthanum (98/99%) 15s. per gram
Manganese Metal (96%-98%) £310
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £20/22 oz. nom.
Osmiridium, nom.
Palladium, £7 10s./£8 0s. oz.
Platinum U.K. and Empire Refined £31/£34 oz.
Imported £28 5s./£28 15s. nom.
Quicksilver, £75 ex-warehouse
Rhodium, £42 oz.
Ruthenium, £15/£17 oz. nom.
Selenium, 75s. nom. per lb.
Silver, 78¼d. f. oz. spot and 78½d. f'd.
Tellurium, 15s. 16s. lb.

ORES AND OXIDES

Bismuth	30% 3s. 3d. lb. c.i.f. 18/20% 5s. 0d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable) 48%	£19 5s. 0d. per ton c.i.f.
,, Hard Lumpy 45%	£19 5s. 0d. per ton c.i.f.
,, Refractory 40%	£13 0s. 0d. per ton c.i.f.
,, Smalls 44%	£18 0s. 0d. per ton c.i.f.
Baluchistan 48%	£12 0s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade	nom.
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% $Ca F_2$)	156s. 0d. ex works
Lithium Ore—	
Petalite min. 3½% Li_2O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	£26 5s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£22 0s. d/d
Manganese Ore Indian	
Europe (46%-48%) basis 130s. freight plus 5% surcharge	125d./127d. per unit c.i.f. nom.
Manganese Ore (43%-45%)	98d./100d. per unit c.i.f. nom.
Manganese Ore (38%-40%)	92d./94d. per unit nom. (including duty)
Molybdenite (85% basis)	8s. 5d. nom. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£45/£47 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	107s. 6d./112s. 6d. per unit c.i.f.
Vanadium—	
Fused oxide 90-95% V_2O_5	£11-£11½ per unit c.i.f.
Zircon Sand (Australian) (65-66% ZrO_2)	£18 per ton c.i.f.

Mining Finance

Copper Profits and Dividends

The preliminary profit and dividend statements of the Rhodesian Selection Trust group of copper companies made no great impact on the share market. This was understandable. The sharp declines in gross profits resulting from the fall in the metal price had already been revealed a month previously by the quarterly reports for the period to June 30, which marked the end of the financial years. The fact that there was an unexpected upturn in the Roan and Mufulira earnings for the final quarter as a result of a sudden spurt in metal sales had also led to the expectation that the final dividends would not be cut to any greater extent than the interims had been in May.

In the event, those who thought along these lines proved to be almost exactly right. But paying out these sums meant at the same time substantial reductions being made in other appropriations. Naturally during the boom years of 1955 and 1956 it had been deemed wise in view of the companies' heavy capital commitments in Rhodesia to make unusually large allocations to reserves. There was thus room for lesser amounts to be taken out of 1956-57 profits. As may be seen from the accompanying table, it was still possible to put sizeable sums aside to reserves and replacements.

Company	*Year ended*	*Sales (l.tons)*	*Taxation* (£000)	*Provision for replacements and obsolescence* (£000)	*Net Profit after Tax* (£000)	*Transfers to reserves* (£000)	*Carry Forward* (£000)
R.S.T.	1956	—	Cr.31	—	4,369	75	39
	1957	—	Cr.38	—	3,066	200	38
Mufulira	1956	92,584	6,583	2,300	9,290	2,535	126
	1957	95,942	4,142	1,500	6,092	1,386	40
Roan Antelope	1956	85,833	5,650	1,500	8,359	3,049	27
	1957	84,687	2,945	1,250	4,217	'1,198	72
Chibuluma ...	1957	15,958	—	400	1,396	1,395	3

The great question now is what will happen in 1957-58. If last year's practice is adhered to the full annual reports which are to be sent out over the week-end of November 16 will include Sir Ronald Prain's review of the past year and of prospects for the current periods. These reviews should be more interesting in the present uncertain situation than for many years. Meanwhile, the facts have to be faced that the price of copper is now £182 per ton whereas the companies' results for the year to June were based on an average in the £250-£260 neighbourhood. It is obvious that the September quarterly reports for the R.S.T. group, which are likely to be issued simultaneously with the annuals, will reveal a fresh drop in earnings, but will still not bring these down to the levels that must be accompanying the present low price of the metal.

Ignoring the R.S.T. fixed price which has now been abandoned and taking London Metal Exchange quotations, copper was still over £200 per ton for the first two months of the September quarter, and even at the end of the period was above £190. What shareholders will thus particularly want to hear from Sir Ronald Prain is by how much further it will be possible for the companies to reduce reserve and replacement allocations for 1957-58. On this factor may depend whether or not Roan, for instance, is able to pay a dividend at all unless there is a material recovery in the metal price. This could, of course,

(*Continued on opposite page*)

LONDON MARKET HIGHLIGHTS

For the greater part of the week to October 16, the Kaffir market made a depressing picture. Admittedly, there was little real selling activity, but there was also a conspicuous absence of buying and prices steadily wilted as business dwindled to a minimum. Such selling as there was emanated from Paris and was thought to be the aftermath of the buying from that centre that took place at the time of the franc devaluation move. On Tuesday, this selling dried up and was replaced by a good demand from the Cape. Prices were quick to respond. At the time of writing it is difficult to tell whether the revival will continue, but at least the basic undertone of the market seems firm enough.

The onset of the September quarterly reports provided a certain amount of stimulus to some stocks. Harmony, in particular, jumped quickly to 28s. 3d. in front of the high values in the new No. 2 shaft area. Good development results also stimulated Western Holdings (73s. 1¼d.), while Free State Geduld (72s. 6d.) responded to the news of best ever values from the No. 2 shaft.

Finance Houses moved with the general trend, but Camp Bird remained a poor spot with a fall to 10s.—the lowest since 1954—before rallying to 10s. 4½d. on the completion of a large selling order. Central Mining (55s. 7½d.) remained persistently weak. Diamonds stayed under the influence of Wall Street, Anglo American Investment falling 6s. to 172s.

In the base-metal group, copper shares continued to lose ground. The R.S.T. and Roan dividend cuts had little effect since they were in line with most expectations, but the realization that the sharply reduced profits stemmed from a copper price of around £250 - £260 a ton caused some gloom in the light of the current quotation. Wall Street did not help matters and new low prices for the year were reached in most copper shares. Prices rallied on Tuesday, but only as a result of end-account bear closing operations. The depressed level of share prices may soon begin to tempt investors back into this market, but the temptation will probably be resisted by the more prudent for some time yet despite any technical recovery that may develop. The substantial fall in prices which was forecast here several weeks ago can be expected to persist until there is either a genuine turn for the better in the metal price outlook or share values discount the even lower profits that look like resulting from the present year's operations. At the moment neither factor is operative.

The one bright spot in the copper market was the rise in "Tanks" to 115s. following the higher dividend, earnings and proposed scrip issue. Enthusiasm was tempered, however, by the fact that these results stemmed from the operations of Union Minière ("Tanks" principal shareholding) during 1956 when copper averaged around £325 a ton. Rio Tinto went ex-rights to the one for six new issue at 50s. The obvious bear selling which had preceded the issue news culminated in a squeeze of sizeable proportions as operators scrambled to cover their short positions. The result was that the old shares jumped to 63s. 9d., which was above the price of the stamp-free new shares which themselves were 3s. up at 12s. 6d. premium.

Other base-metal shares were generally lower. Tins succumbed because, although this metal is better placed statistically than the others, the current necessity for the Buffer Stock Manager to support the price at £730 a ton has caused some apprehension. Among the many share price falls, Ayer Hitam came back to 26s. and Southern Malayan to 9s. 6d. Lead-zincs continued to be depressed, the latest Board of Trade decision to unload lead stocks on an already queasy metal market being an additional bearish influence. Consolidated Zinc fell 8s. 3d. to 51s. 3d.

Elsewhere, West African golds remained overshadowed by the uneasy political situation in Ghana. Ashanti accordingly fell to 11s. 7½d. Of other overseas stocks, 'Friscos picked up (to 20s.) on the interim and the O.T.C. tax statement, while Mount Morgan eased to 10s. following the annual report. London and Rhodesian (8s. 9d. at one time) also drooped on the news of the unchanged dividend which was not fully covered by the lower profits; in the light of the directors' recent and successful determination to thwart a bid of 14s. 6d. for the shares these results may provoke some interesting discussions at the company's next annual meeting.

quite well take place during the remaining nine months to June 30 next.

Before leaving the R.S.T. group a word about Chibuluma may be useful. R.S.T. has a 64 per cent interest in this new mine, which started production in March, 1956. Thus the year to June 30 last is its first full period. The company was largely financed by the U.S. Government and the past year's profits have been put to reserve principally to provide for repayment of the £5,000,000 loan from that source. No dividend is thus declared. It has also to be borne in mind that during the June quarter a shortage of group smelting capacity meant that Chibuluma produced only 2,721 tons of copper against 5,231 tons in the March quarter. As a result there is now a stockpile containing some 9,000 tons of recoverable metal all of which is expected to be smelted during the current financial year. Eventually, of course, R.S.T. income, now almost entirely derived from the 64 per cent stake in Mufulira, will be augmented by Chibuluma dividends.

O.T.C. TAX CONCESSIONS

The subject of Overseas Trading Corporation tax concessions remains a number one topic. Last week Southern Kinta and Amalgamated Tin of Nigeria were commented on here in this respect. Since then the full report of the latter company has appeared. It confirms that the O.T.C. tax benefits are still to come. Qualification as an O.T.C. did not occur until October 1. There should thus be a rebate in due course in relation to the tax provision shown in the accounts for the year to March 31 last and, of course, a lessening of the current year's tax burden. These concessions will be welcome enough in a period which, as the chairman, Mr. Ivan Spens, indicates, looks as though it will bring a further decrease in earnings. It has been decided that " in view of the fall in profits " the company will now consider dividends half-yearly instead of thrice yearly as heretofore. This means that the interim for 1957-58 should be declared next February instead of next month as last year.

Another particularly interesting O.T.C. situation is that of Beralt, which produces tin and wolfram in Portugal. In the same way that Amalgamated Tin is suffering from the collapse of the market for columbite, Beralt is now facing a crisis situation in relation to its principal product, wolfram. So far the company has been insulated to some extent against the worst effects of the substantial drop in the price of this metal by a far-sighted forward contract entered into during the boom period which actually did not run out until the end of last month. Henceforward, apart from the fact that the company turns out a high-grade product which commands a premium over the normal quotation, Beralt is completely exposed to a market price for wolfram of 110s. per unit compared with an average received for the year to March 31 last of 274s. 6d.

It is in this context that the tax savings inherent in the fact that the company qualified as an O.T.C. as from September 24 must be a useful cushion. For 1956-57 full provision for U.K. tax amounting to £550,543 was made on a profit of £876,117, which compared with a surplus of £983,247 for the preceding year. From the remaining net figure of £325.574 the maintained dividend of 160 per cent on the 5s. stock units takes £304,520 net. In the new tax circumstances this distribution should not be such a full one as it looks, because there ought in due course to be a fairly substantial tax saving to be credited from the 1956-57 allocation for this purpose. And, of course, the tax liability for the current year will be relatively lighter.

This does not mean that a dividend cut is likely to be avoided even taking into account the company's exceptionally strong financial position. It is understood that the chairman's speech may contain proposals for putting some of the surplus cash to profitable use. Beralt are down to 31s. ex the final dividend of 5s. gross, their lowest level since 1955. For half the current period to March 31 next there will still have been the forward contract safeguard. It looks, in fact, as though the 5s. units are now allowing quite a lot for future eventualities.

RIO TINTO

Two new points emerged from the official Rio Tinto issue statement that followed the comments in these notes last week. Firstly, it was officially confirmed that it is intended to maintain the 1957 dividend on the higher capital, the proposed rate being 26 per cent gross compared with 15 per cent tax free for 1956. Secondly, contrary to expectations, the new money is not connected even in part with the Empress nickel-copper deposit in Southern Rhodesia, it having been decided to postpone the date of full-scale development of this project. The new funds are, in fact, for the furtherance of Rio Tinto's extensive Canadian uranium interests.

Clutha River.—In *The Mining Journal* of September 27 it was stated that the dividend of 5 per cent had been declared on an issued capital of £225,000 on shares of 2s. each. It has been pointed out that a capital reduction became effective in January last, by virtue of which the company's issued capital is now £166,666 13s. 4d. divided into shares of 1s. 8d. each.

Improved Diamond Sales. — De Beers Consolidated Mines announce that sales through the Central Selling Organization on behalf of South African and other producers in the quarter ended September 30 reached a total of £21,444,588, made up of £15,114,159 gemstones and £6,330,429 industrial diamonds. Sales in the preceding quarters are summarized below.

Quarter ended:	*Sales*
September, 1957	£21,444,588
June, 1957	£19,949,451
March, 1957	£17,742,014
December, 1956	£19,686,418

Record Broken Hill Profits.—Consolidated taxed profits of Broken Hill South in the year ended June 30 rose from last year's £A1,954,120 to a new record of £A1,969,430. The recommended final dividend remains at 90 per cent, making an unchanged total for the year of 170 per cent.

Wankie Earns More.—Wankie Colliery Co. Ltd. announce that the profit for the year ended August 31, 1957, was £997,030 (1956—£891,647) after all charges including Debenture Interest of £153,406 (1956—£192,500) and taxation of £230,000 (1956—£250,000). £170,000 (1956—£105,000) was transferred to Taxation Equilization Reserve, and £285,000 (1956—£250,000) was appropriated to General Reserve. Dividends totalling 1s. 1½d. per share and absorbing £577,640 (1956—1s. per share, £441,250) have already been declared during the year.

CLUTHA RIVER GOLD DREDGING, LTD.

The twenty-third annual general meeting of Clutha River Gold Dredging, Ltd., was held on October 16, at 73 Cheapside, London, E.C.2.

Mr. F. G. Payne, M.I.Mech.E., Chairman, presided, and the following is an extract from his circulated Statement :—

In my address to you last year I said it was anticipated that dredge returns would show some improvement, and it is satisfactory to find that the results have borne this out.

Mining statistics for the year ended March 31, 1957, are as follows (the previous year's figure shown in brackets) :—

Area worked : 18.87 acres (19.5)
Average depth : 95 feet (97)
Yardage treated : 2,886,000 cubic yards (3,064,000)
Hours worked : 6,246 hours (6,090)
Gold recovered : 6,027 ounces gold bullion (5,459)
Average recovery value per cubic yard of ground treated : 5.99 pence (5.09)
Estimated value of Fine Gold recovered : £71,583 (£64,935)
Working costs : £52,553 (£50,200)
Working costs per cubic yard : 4.37 pence (3.93)

The net profit after charging £10,140 for taxation amounts to £8,640. A dividend of five per cent. is recommended, leaving a balance of £4,138 to be carried forward to the current year.

With reference to Overseas Trade Corporations it would appear that this Company should benefit by the provisions of the Act, but at this stage I cannot give you definite information as to the extent of the relief.

Dredging Programme

Now I will deal with the future policy of the Company in regard to the dredging programme. For guidance in forming an opinion as to the best course for the dredge to follow the Earnscleugh area has been divided into 5 Blocks. Block 1 comprises the ground worked by the dredge for the two years ending March 31, 1957, and Blocks, 2, 3, 4 and 5 represent the whole of the area remaining to be worked. The dredge has now turned into Block 2 which has slightly under two years life and shows better boring values than Block 1. It is then proposed to work out Block 5, which adjoins the southern boundary of Block 2 and is shown by boring to be considerably richer than any of the other areas. Block 5 should have approximately 3 years working life for the dredge.

Summarizing the prospects, it would appear well worth while carrying on dredging operations until Blocks 2 and 5 are worked out, which should take roughly five years. Blocks 3 and 4, which are on the western side of the property, compare favourably with Block 1 but whether or not it is ultimately decided to work these Blocks will depend on the conditions regarding gold price and costs at the time.

All Gold Producers are united in pressing for a higher price to bring this precious metal more into line with the conditions of inflation that exist to-day. It seems doubtful if America will move in this matter, and perhaps a more realistic hope is that some form of international agreement may yet be made in order to achieve a world-wide revaluation of gold without altering the comparative values of the various currencies.

KINTA KELLAS TIN DREDGING COMPANY

The Thirtieth Annual General Meeting of Kinta Kellas Tin Dredging Company Ltd. was held in London on October 11, **Mr. P. J. Burgess** (the Chairman) presiding. The following is an extract from his circulated statement:

The past twelve months have been fateful ones for Malaya with the coming of "Merdeka" on August 31, 1957, by which the Federation of Malaya achieved independence and political freedom within the Commonwealth. A novel form of constitutional Monarchy was established by the election of a Paramount Ruler, or Supreme Head of State, with a Deputy, both being elected by the Conference of Rulers of the eleven separate Malay States.

The Supreme Head of State elected is Sir Abdul Rahman Ibni Tuanku Mohammed, designated "His Majesty".

The present Chief Minister, Tunku Abdul Rahman Putra, will become the first Prime Minister in the Malayan Parliament, which is still to be formed and will consist of about 100 members.

There has already been an important declaration of policy made by the Minister for Commerce and Industry as affecting capital and designed to encourage foreign capital to enter and to persuade foreign capital already existing in Malaya to remain there. It would have been too much perhaps to expect guarantees for future fair treatment to be written into the Constitution, although declarations of good intentions are somewhat slender security for the colossal risks involved. Nevertheless, the Leaders in the new Federation of Malaya may be assured of having the goodwill and co-operation of both the tin and rubber interests in working to make an outstanding success of this great adventure.

The movements in the tin market during the period under review have been small, but with a downward trend more recently, but as is seen in the report of Messrs. Osborne & Chappel on the working of the Dredge, the cost per cu. yd. at the mine was considerably higher, due to higher labour costs and a greater amount which the Board have deemed it advisable to set aside for repairs and renewals. I cannot hold out hope of any reduction in this trend with the ever-increasing rise in the standards of living in Malaya and Asia generally and with the growth of labour unions in all directions.

Attention should not be focused on the rates of dividend paid on Tin shares in Malaya without consideration of the capital structure of the dredging companies where the replacement values of machinery and buildings are many times greater than the issued share capital on which the dividend is paid.

We have had a reasonably successful year though adversely affected by too much clay, high overburden and generally poor paddock conditions. We hope this is now mostly over and that better conditions lie ahead.

We have been fortunate in escaping interference from the roving bands of Communist armed guerillas during the year and it is probable that the new Constitution may see the early end of the "Emergency".

The report was adopted and the total distribution of 20 per cent approved.

AMALGAMATED TIN MINES OF NIGERIA

CHAIRMAN'S STATEMENT

The eighteenth Annual General Meeting of Amalgamated Tin Mines of Nigeria Limited will be held on November 4 at The Chartered Insurance Institute, 20 Aldermanbury, London, E.C.

The following is the Statement by **Mr. J. Ivan Spens, O.B.E.**, the Chairman, which has been circulated with the Report and Accounts for the year ended March 31, 1957.

Accounts

The Accounts are set out in the same form as in previous years. The profit for the year, before taxation, is £674,919 against £1,235,366 for the previous year. The reduced profit is due in the main to a decrease in the production of tin concentrate and to a reduction in the sales of columbite concentrate. Mining costs increased and although the average price of tin metal realized was slightly higher at £775 per ton the columbite sold during the year realized considerably less than in the previous year.

Taxation takes £387,000 against £695,500 last year and this reduction provides a cushion against the fall in the profit as compared with last year. Dividends paid during the year, together with the final dividend of 9 per cent now recommended by your Directors, absorbs £280,312, leaving £7,607 to be added to our carry forward which now is £288,370.

Shareholders will see from the Balance Sheet that there has been a fall of some £400,000 in the net liquid position during the year which is accounted for by our cash contribution to the Buffer Stock of £208,973, increases in stores and tin and columbite stocks and net additions to fixed assets.

Overseas Trade Corporations

Your Company will benefit under the Overseas Trade Corporation provisions of the Finance Act, 1957. Due to the purely domestic arrangements for selling our tin and columbite concentrates your Company did not qualify as from April 6, 1957. However, arrangements have now been made in the selling of our concentrates to comply with the provisions of the Act and your Company will qualify as an Overseas Trade Corporation as from October 1, 1957.

The tax provision in the Accounts has been made excluding any relief from Overseas Trade Corporation status and the sum set aside for future tax may be in excess of the actual liabilities when these are finalized.

Columbite

The sales of columbite were down on the previous year. Sales are difficult, but it is still hoped to obtain a market on the Continent and other countries. The demand for columbite is still small, but articles in the technical press and symposia held in this country and in the United States of America, indicate a revival of interest in the uses of niobium. At the year end, in addition to stocks held in Nigeria, there was a small stock of columbite held in this country and in America to ensure prompt delivery.

Ore Reserves

Tin ore reserves at the end of the financial year were estimated at 41,116 tons, a net decrease on the year of 1,333 tons against the 4,168 tons of concentrates won.

Subsidiary Companies

KEFFI TIN COMPANY LIMITED.—The pilot plant continued treating decomposed granite for the recovery of primary columbite until November 30, 1956, when the plant was closed down. The output for the year was 201 tons of columbite and 61 tons of tin concentrate.

After modifications to the treatment plant all the equipment, including the earth-moving units, were hired to Amalgamated Tin Mines of Nigeria Limited for the treatment of alluvial wash brought from nearby workings.

Research in the ore-dressing laboratory, in the mill and at the pilot plant has resulted in improved recovery of primary columbite and associated minerals. Much of this knowledge will be utilized to improve the recovery of fine grain mineral from the alluvial workings.

LONDON NIGERIAN MINES LIMITED.—The Company continued to operate satisfactorily, the output for the year being 300 tons of tin concentrates, an increase of 20 tons on last year.

Labour

Relations with our African employees have been mainly free from serious differences. The Joint Industrial Council continued their meetings under an independent Chairman appointed by the Minister of Labour.

Arrangements were made for senior African staff to visit this country for courses of instruction and three have done so since the close of the financial year.

Welfare

Amenities have been improved where practical and the whole question of staff welfare continues to receive the attention of your Board and Management. The Technical Managers' Report on pages 12 and 13 records progress during the year.

General

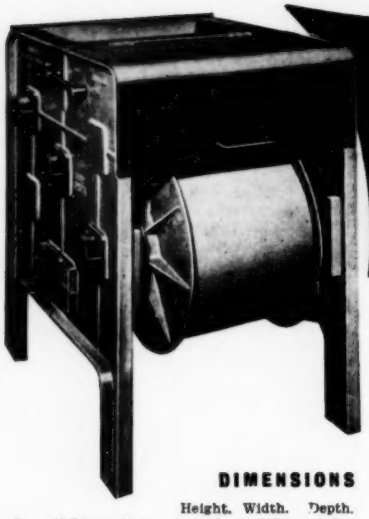
I have recently returned from a tour of the properties in Nigeria and this included visits to the subsidiary companies' areas. I was able to discuss the various problems with the Management on the spot and am pleased to be able to report favourably on my tour. It is intended to do everything possible to increase production of tin concentrates and to this end it is proposed to purchase further equipment. At the same time we will be prepared to step up our production of columbite when it becomes necessary. Costs, however, continue to rise due to the increases in the cost of labour, power and materials generally and unless the price of tin improves and the indicated revival of interest in columbite eventuates the profits for 1957-58 are likely to be affected.

Dividends at the present time are paid in October, December and March. In view of the fall in profits, apart from the expense involved, your Directors propose to consider payments of dividends half-yearly in, say, March and October of each year.

Sir Eric Mieville, G.C.I.E., K.C.V.O., C.S.I., C.M.G., accepted an invitation to join the Board in November, 1956, but found it necessary to resign in March, 1957, owing to pressure of other commitments. We were sorry only to have the benefit of his services for such a short period, but we were fortunate in obtaining Lord Colyton, P.C., C.M.G., to fill the vacancy. You will be asked to vote his re-election at the Annual General Meeting.

Staff

We wish to thank the Management and Staff of A. O. Nigeria Limited, our General Managers in Nigeria, as well as all African employees, for their continued loyalty which has earned our appreciation.



for the extraction of iron impurities from non-ferrous swarf, minerals, residues, etc.

DIMENSIONS

	Height.	Width.	Depth.
Overall Dimensions:	37"	31"	34"
Drum Dimensions:	12" dia.		14" face.
Nett weight:			950 lbs.
Boxed:	1100 lbs.		37 cu. ft.
H.P. Drive: ½.			
Total Input:			600 watts.

Distance flange of drum to ground: 12½".

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